



WV Route 9: Charles Town to Martinsburg WVDOH/Hi-Way Paving

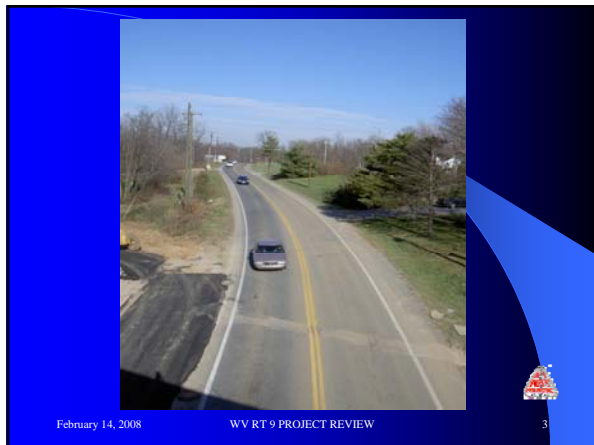



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WV Route 9: Charles Town to Martinsburg

- LOCATED IN BERKELEY AND JEFFERSON COUNTIES, WV
- EXISTING ROUTE 9
 - ✓ TWO LANE WITH HIGH ACCIDENT RATE
 - ✓ GROWING TRAFFIC CONGESTION
 - ✓ LIMITED SIGHT DISTANCES
 - ✓ NO RIGHT TURN LANES
 - ✓ NO SHOULDERS CAPABLE OF EMERGENCY PULL OFFS

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WV Route 9: Charles Town to Martinsburg

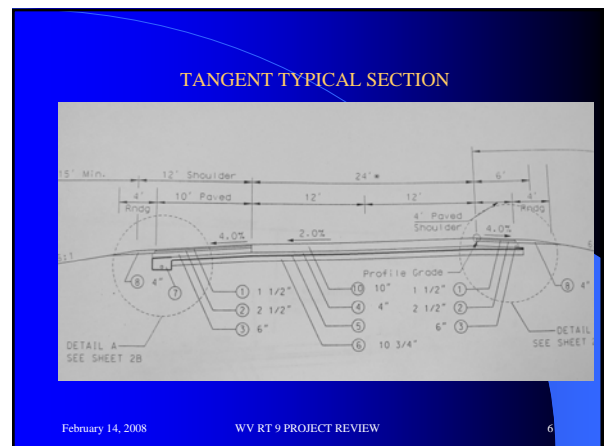
- APPROXIMATELY 10.5 MILES OF NEW LOCATED STATE ROUTE 9
 - ✓ 4 LANE MOSTLY LIMITED ACCESS HIGHWAY
 - ✓ DESIGN OF CONCRETE PAVEMENT BASED ON WVDOH LIFE CYCLE COST ANALYSIS (original asphalt design)

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WV Route 9: Charles Town to Martinsburg

- NEW RELOCATED ROUTE 9
 - ✓ MAINLINE AND RAMP PAVEMENT DESIGN = 10" NON-REINF. PORTLAND CEMENT CONCRETE, WITH LOAD TRANSFER DOWELS AT 15' SPACING
 - ✓ 10' WIDE OUTSIDE, 4' WIDE INSIDE FULL DEPTH ASPHALT SHOULDERS AND APPROX. 46' MEDIAN BETWEEN DIRECTIONAL LANES

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PRE-GRADED SECTION



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PRE-PAVING OPERATIONS

➤ UNDERDRAIN SYSTEM




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➤ UNDERDRAIN SYSTEM



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➤ UNDERDRAIN SYSTEM



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PRE-PAVING OPERATIONS

➤ SEPARATION FABRIC



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PRE-PAVING OPERATIONS

➤ OPEN GRADED FREE DRAINING BASE
(CEMENT or ASPHALT TREATED)



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Basket Layout & Setting



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Concrete Batching



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Placing/Finishing/Curing



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Placing/Finishing/Curing



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➤ Transverse texture via cure/texture machine using 1/2" c/c tining spec.



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Transverse and Longitudinal Joint Sawing

- Cuts are made to a depth of $3.33''(T/3) \times 1/8''$ width
- Joints are cut as soon as possible without causing significant raveling

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PROJECT INNOVATIONS – UNSEALED JOINTS

➤ **SAWED JOINTS NOT WIDENED AND NOT SEALED**



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PROJECT INNOVATIONS – CRCP TEST SECTION

➤ **TEST PAVEMENT SECTIONS IN COOPERATION WITH WEST VIRGINIA UNIVERSITY, (Dr. Hota GangaRoa, P.E. Dr. Roger Chen, P.E. And Jeong Choi, Doctorial Candidate)**

- ❖ CONTINUOUS REINFORCED CONCRETE PAVEMENT (CRCP)
 - ✓ CONTINUOUS STEEL REBAR REINFORCEMENT
 - ✓ CONTINUOUS GLASS FIBER REINFORCED POLYMER (GFRP)
 - ✓ ADDITIONAL COMPRESSIVE STRENGTH CONCRETE SPECIFIED

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PROJECT INNOVATIONS – CRCP TEST SECTION

➤ **TEST PAVEMENT SECTIONS - JOINTS**

- ✓ SAWED AND SEALED LONGITUDINAL JOINT (SILICONE)
- ✓ NO SAWED TRANSVERSE JOINTS (TRANSVERSE CRACKS PREDICTED TO OCCUR EVERY 3 TO 7 FEET)

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PROJECT INNOVATIONS – CRCP TEST SECTION

➤ **1,000 L.F.T. X 24' WIDE CONTINUOUS STEEL REINFORCED CONCRETE SLAB**

- ✓ LONGITUDINAL REINFORCING #6 BAR @ 6" CENTER TO CENTER
 - ✓ LAPS STAGGERED ALTERNATING EVERY THIRD BAR
 - ✓ STAGGERING DISTANCE WILL BE 1/3 LENGTH OF BAR (40/3 = 13.33')
 - ✓ SPLICE LENGTH 22 1/2" INCHES
 - ✓ CONVENTIONAL STEEL WIRE TIES
- ✓ TRANSVERSE REINFORCING #5 BAR @ 48" CENTER TO CENTER
 - ✓ 13'3" TRANSVERSE BAR ASSEMBLIES WITH CHAIRS AND CLIPS

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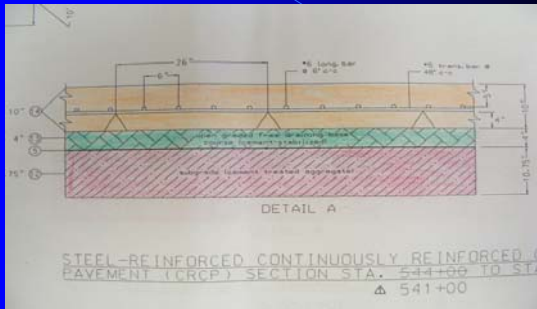
PROJECT INNOVATIONS – CRCP TEST SECTION

➤ **1,000 L.F.T. X 24' WIDE CONTINUOUS GLASS FIBER REINFORCED POLYMER CONCRETE SLAB**

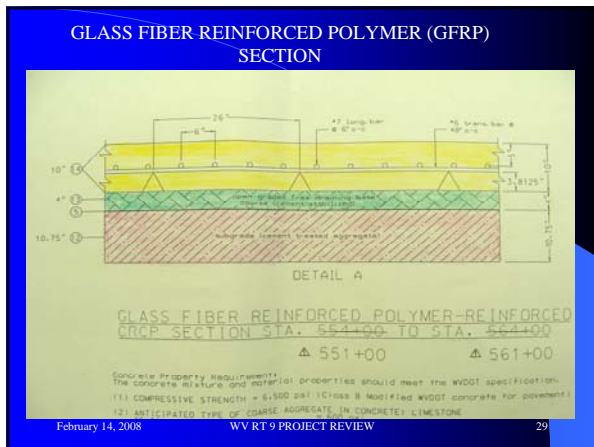
- ✓ LONGITUDINAL REINFORCING #7 BAR @ 6" CENTER TO CENTER
 - ✓ LAPS STAGGERED ALTERNATING EVERY THIRD BAR
 - ✓ STAGGERING DISTANCE WILL BE 1/3 LENGTH OF BAR (40/3 = 13.33')
 - ✓ SPLICE LENGTH 35" INCHES
 - ✓ UTILIZING NYLON ZIP TIES
- ✓ TRANSVERSE REINFORCING #6 BAR @ 48" CENTER TO CENTER
 - ✓ 13'3" TRANSVERSE BAR ASSEMBLIES WITH PLASTIC CASTLE CHAIRS AND CONCRETE BRICK
 - ✓ UTILIZING NYLON ZIP TIES

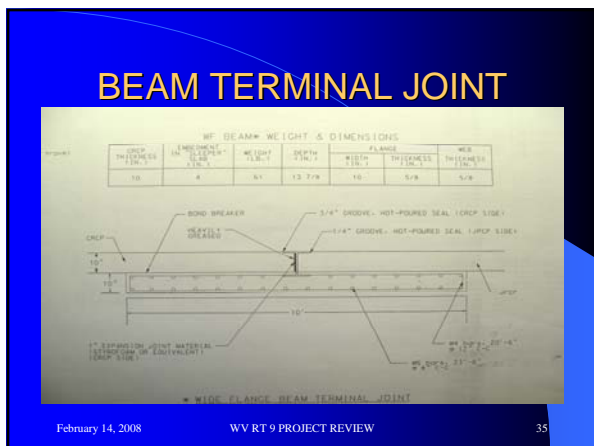
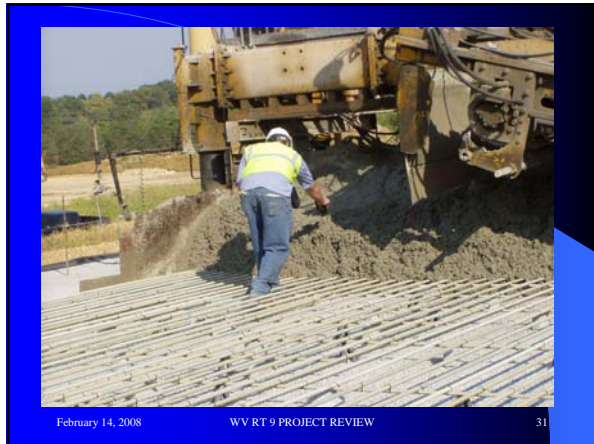
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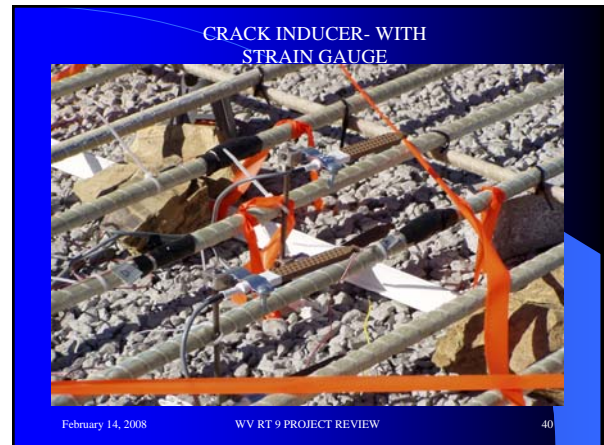
CONTINUOUS STEEL REINFORCED SECTION



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GFRP VS STEEL REINFORCEMENT

- 1,000 LFT X 24' WIDTH TEST SECTION OF EACH TYPE
- MATERIAL USED
 - ✓ 82,900 LBS STEEL REBAR REINFORCEMENT @ APPROX \$.40/LB
 - ✓ 28,300 LBS GFRP REINFORCEMENT @ APPROX \$2.53/LB
 - ✓ OVER 16,000 ZIP TIES USED WITH GFRP

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**GFRP VS STEEL
CRCP REINFORCEMENT**

- MORE INFO:
 - ANNUAL MID ATLANTIC QUALITY ASSURANCE WORKSHOP, FEB.5-7 MORGANTOWN, WV – DR. ROGER CHEN, P.E., WVU

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